Macintosh™ LC Special Options and Technical Information

Options

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Warning

This equipment has been certified to comply with the limits for a Class B computing device in accordance with the specifications in Part 15 of FCC rules. Only peripheral devices (computer input/output devices, terminals, printers, and so on) certified to comply with Class B limits may be attached to this computer.

Operation with noncertified peripheral devices is likely to result in interference to radio and television reception.

DOC Class B Compliance This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the radio interference regulations of the Canadian Department of Communications.

Observation des normes—Classe B Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la Classe B prescrites dans les règlements sur le brouillage radioélectrique édictés par le Ministère des Communications du Canada.

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Radio and television interference

The equipment described in this manual generates and uses radio-frequency energy. If it is not installed and used properly—that is, in strict accordance with Apple's instructions—
it may cause interference with radio and television reception.

This equipment has been tested and complies with the limits for a Class B computing device in accordance with the specifications in Part 15 of FCC rules. These specifications are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that the interference will not occur in a particular installation.

You can determine whether your computer is causing interference by turning it off. If the interference stops, it was probably caused by the computer or one of the peripheral devices. If your computer system does cause interference to radio or television reception, try to correct the interference by using one or more of the following measures:

- Turn the television or radio antenna until the interference stops.
- Move the computer to one side or the other of the television or radio.
- Move the computer farther away from the television or radio.
- Plug the computer into an outlet that is on a different circuit from the television or radio. (That is, make certain the computer and the television or radio are on circuits controlled by different circuit breakers or fuses.)
- Consider installing a rooftop television antenna with a coaxial cable lead-in between the antenna and the television.

If necessary, consult your authorized Apple dealer or an experienced radio/television technician for additional suggestions. You may find helpful the following booklet, prepared by the Federal Communications Commission: *How to Identify and Resolve Radio-TV Interference Problems* (stock number 004-000-00345-4). This booklet is available from the U.S. Government Printing Office, Washington, DC 20402.

△ **Important:** Changes or modifications to this product not authorized by Apple Computer, Inc., could void the FCC certification and negate your authority to operate the product.

This product was tested for FCC compliance under conditions that included the use of shielded cables and connectors between system components. It is important that you use shielded cables and connectors to reduce the possibility of causing interference to radios, television sets, and other electronic devices. For Apple peripheral devices, you can obtain the proper shielded cables from your authorized Apple dealer. For non-Apple peripheral devices, contact the manufacturer or dealer for assistance. △

Special Options and Technical Information

Macintosh™ computers are designed so that if you know how to use one type of Macintosh, you know how to use them all. Most of the books and disks that came with your computer describe how to use the many features that all Macintosh computers share.

But each Macintosh model also has some distinctive features. This book describes the special features of your Macintosh LC.

If you are new to Macintosh computers, it's a good idea to set up your equipment and learn basic Macintosh skills before reading this book. *(See the booklet Setting Up Your Macintosh LC* for more information.) As soon as you feel comfortable with your new computer, read any sections of this book that describe features of interest to you.

Save this book; it contains information not included in the other manuals that came with your computer.

Special features overview

The Macintosh LC has several special features that differentiate it from other Macintosh computers. Here is a brief look at a few of those features.

- Sound input capability allows you to incorporate sound into your work as easily as you can already incorporate graphic elements. The use of sound strengthens your ability to communicate information effectively, and adds an exciting new dimension to the documents that you can produce with your computer.
- Built-in video support allows you to use any one of several monitors with your Macintosh LC, without having to purchase and install a separate video card.
- An expansion slot allows you to use an expansion card in your Macintosh LC to enhance the performance of your computer with additional video, coprocessing, or network capabilities.
- Keyboard-based interrupt and reset switches replace the plastic programmer's switch that must be installed separately on most other Macintosh models.

The sections that follow explain these features in more detail.

Sound input capability

Your Macintosh LC can record sounds using a microphone or other audio source connected to the built-in sound input port on the computer's back panel.

To get acquainted with the sound recording facilities, you can use the Sound Control Panel to record your own customized alert sounds (the sounds your Macintosh uses to signal you). See "Recording and Removing Alert Sounds" in this booklet for more information.

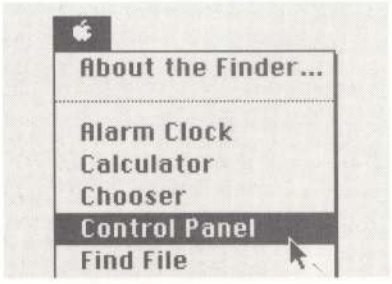
In addition, there are application programs that let you record, edit, and play back sounds using your Macintosh LC. See your Apple dealer for more information on programs that take advantage of the sound capabilities of your computer.

Recording and removing alert sounds

One way that you can experiment with your computer's sound input capability is to record your own alert sounds. Alert sounds are the sounds your Macintosh uses when it signals you (a little beep is the most familiar one). Using the Sound Control Panel, you can record your own alert sounds and remove sounds that you no longer want.

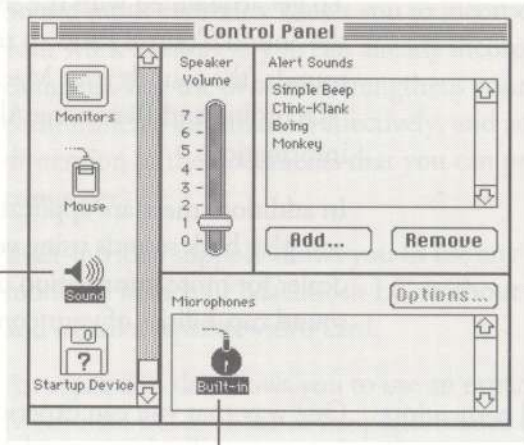
Follow these steps to add new alert sounds or to remove old ones:

1. **Connect the microphone or other sound input device as described in *Setting Up Your Macintosh LC.***
2. **Choose Control Panel from the Apple (🍎) menu.**



3. **Click the Sound icon on the left side of the Control Panel.**

You may have to scroll through the list to see the Sound icon.



The sound controls appear. Icons representing the sound input devices appear at the bottom of the window. Select the one that represents the input device you want to use. (If you have only one sound input device connected to your computer, you don't need to do this; continue with step 5.)

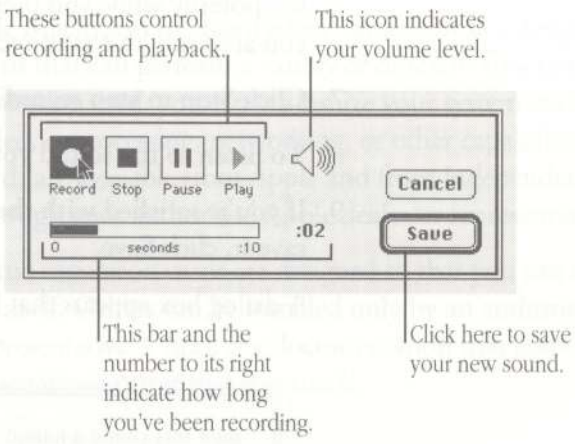
4. **Click the icon that represents the sound input device you want to use.**

5. **To record a new alert sound, click the Add button. To remove an existing sound, select the sound in the list, and click the Remove button.**

   You cannot remove the Simple Beep sound.

   If you clicked Remove, a dialog box appears asking you to confirm that you want to remove the sound. Click OK to remove the sound.

   If you clicked Add, the Record dialog box appears.



6. **To record your new sound, click the Record button.**

   Recording begins immediately, and you have ten seconds to record your sound. The speaker icon on the recording dialog box shows you the volume of the sound you are recording. There is no recording volume control. To adjust the volume of the recorded sound you must make the sound itself louder or softer as you record it.

   The bar below the recording controls and the number to its right tell you how long you have been recording.

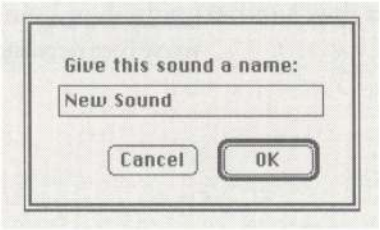
   If you need to stop recording temporarily, click the Pause button. For example, if you want to include a series of sounds in your new alert sound, you may need to interrupt recording temporarily while you prepare the next sound segment. When you are ready to resume recording, click the Pause button again.

7. **Click Stop to stop recording.**

8. **To listen to the sound you just recorded, click Play.**

9. **If you're satisfied with the sound you just recorded and want to save it, click Save.**

   A dialog box appears that lets you name your new sound.



10. **Type a name for your sound, and click OK.**

    Your new alert sound is stored with the name you typed. The new sound appears in the Alert Sounds list in the Sound Control Panel.

Video display support

Video support for several types of Apple™ monitors is built directly onto the Macintosh LC main logic board, eliminating the need for a separate video card. The monitors you can connect include

- The Macintosh 12" RGB Display
- The Macintosh 12" Monochrome Display
- The AppleColor™ High-Resolution RGB Monitor

You can control the number of colors or grays displayed on your monitor using the Control Panel. See the Macintosh Reference for instructions.

Expansion slot and cards

The Macintosh LC has a single expansion slot designed to accept cards that can perform a variety of different functions. By using an expansion card, you can customize your system with additional video, coprocessing, networking, or other capabilities. Expansion cards are available from Apple and from independent suppliers through your authorized Apple dealer or representative.

Some expansion cards are designed so that you can install them yourself. Others can be installed only by an authorized Apple representative. Check the documentation that comes with your card to see if you can install it yourself.

▲ **Warning:** To avoid damaging your computer and expansion card, do not attempt to install any expansion card in a Macintosh LC without first checking the documentation for that card. If the documentation specifies that an authorized Apple representative must install the card (usually because the installation requires moving the main logic board), be sure to have your Apple dealer or service representative do the installation. ▲

Reset and interrupt switches

If you've used other models of Macintosh computers, you may already be familiar with reset and interrupt switches. On other Macintosh models, these two switches are activated by a small plastic part called the programmer's switch. (You do not need a programmer's switch to work with your Macintosh. The switch is provided as a convenience for Apple's developers.)

The Macintosh LC has keyboard-based reset and interrupt switches. There is no longer a plastic programmer's switch, because the two functions of that switch are now available as combination keystrokes on any Apple Desktop Bus™ (ADB) keyboard:

Reset	Command (⌘)–Control–Reset (◁)
Interrupt	Command (⌘)–Reset (◁)

Using the reset feature is like turning the power switch off and then immediately back on. In the normal use of your computer you generally have no need to reset, because you use the on/off switch on the back of the computer to turn the computer on, and the Shut Down command in the Special menu together with the on/off switch to turn the computer off. The reset function is useful in rare situations when a software problem occurs and your computer seems to "freeze up." Because using the reset function restarts the computer, you will lose any work that you have not saved.

The interrupt feature is for programmers, and works only if you have appropriate debugging software installed. Debugging software is available from the Apple Programmers and Developers Association (APDA™).

Technical information

The following sections provide detailed technical specifications for your Macintosh LC.

Main unit

Processor

- MC68020, 32-bit architecture, 15.6672 megahertz (MHz) clock frequency

Memory

- 2 MB RAM, expandable to 10 MB
- 512K ROM
- 256 bytes of parameter memory

Video RAM

- 256K video RAM, upgradable to 512K
- With 256K video RAM, these video modes are supported:

  512 x 384 pixels with 1, 2, 4, and 8 bits per pixel
  640 x 480 pixels with 1, 2, and 4 bits per pixel

- With 512K video RAM, these video modes are supported:

  512 x 384 pixels with 1, 2, 4, 8, and 16 bits per pixel
  640 x 480 pixels with 1, 2, 4, and 8 bits per pixel

Disk drives

- Built-in SuperDrive™ 1.4 MB high-density floppy disk drive
- Optional internal 40 MB Apple SCSI hard disk drive or optional second internal SuperDrive
- Optional external Apple SCSI hard disk drives (several capacities available)
- Optional internal 80 MB Apple SCSI hard disk drive with upgrade kit

Sound generator

- Custom sound chip, including mono sampling generator capable of driving stereo miniature phone jack headphones or stereo equipment by sending the same output into each channel

Interfaces

- One Apple Desktop Bus port supports a keyboard, mouse, and other devices daisy-chained through a low-speed, synchronous serial bus (maximum of three chained devices)
- Two serial (RS-232/RS-422) ports, 230.4 Kbits per second maximum (up to 0.920 megabits per second if clocked externally)
- SCSI interface
- Video port supports RGB and monochrome monitors of various sizes and resolutions
- Internal expansion slot for processor-direct expansion card
- Sound output port capable of delivering monophonic sound to both channels of a stereo device
- Sound input port for monaural sound input

Input

- Line voltage: 100–240 volts AC, RMS automatically configured
- Frequency: 50–60 Hz ±3 Hz single phase
- Power: 50 watts maximum, not including monitor power

Clock/calendar

- CMOS custom chip with long-life lithium battery

Power

- 47 watts maximum

Current type	Total
+5 volt	6.8 amps
+12 volt	0.8 amp
–12 volt	0.3 amp

Monitors

- Supports the following monitors:

  Macintosh 12" RGB Display

  Macintosh 12" Monochrome Display

  AppleColor High-Resolution RGB Monitor

- Other Apple and non-Apple monitors may also be supported, if used in conjunction with expansion cards. See your authorized Apple dealer for details.

Keyboard

- Apple Desktop Bus Keyboard with numeric keypad

Mouse

- ADB mouse: either mechanical-tracking, optical-shaft, or contact encoding

Apple Desktop Bus power requirements

- Maximum power draw for all ADB devices: 200 milliamps (mA)
- Mouse draws 80 mA
- Keyboard draws 25 mA

❖ *Note:* Up to three ADB devices can be daisy-chained to the ADB port. ❖

RAM configurations

RAM in the Macintosh LC is provided both on the logic board and in packages called Single In-line Memory Modules, or SIMMs. The SIMMs contain dynamic RAM chips on a single circuit board, with electrical "finger" contacts along one edge that plug into the SIMM sockets on the computer's logic board.

Macintosh LC computers can work with any of several RAM configurations, depending on the density of the RAM chips that are mounted on the SIMMs. The Macintosh LC can use only 1, 2, or 4 MB RAM SIMMs. Do not purchase 256K SIMMs for use with the Macintosh LC.

Possible RAM configurations include 2, 4, 6, and 10 MB.

△ **Important:** Macintosh LC SIMMs should be fast-paged mode 100 ns RAM access time or faster. The slower 120 ns and 150 ns SIMMs available for some other models of Macintosh computers will not work in the Macintosh LC. △

Microphone and stereo adapter

- The microphone is an electret type, omnidirectional microphone that is powered by the computer. Microphone output voltage is 4 millivolts (mV) peak to peak at normal speaking volume.
- The stereo adapter mixes the left and right channels and attenuates the mixed signal to 4 mV peak to peak.

Size and weight

Weight	Height	Width	Depth
Main unit			
4.0 kg	77 mm	310 mm	382 mm
8.8 lb.	3.0 in.	12.2 in.	15.0 in.
Mouse			
0.17 kg	27.9 mm	53.3 mm	96.5 mm
6 oz.	1.1 in.	2.1 in.	3.8 in.
Keyboard			
1 kg	44 mm	418 mm	142 mm
2 lb.	1.8 in.	16.5 in.	5.6 in.

Environment

Operating temperature

- 10° C to 40° C (50° F to 104° F)

Storage temperature

- –40° C to 47° C (–40° F to 116.6° F)

Relative humidity

- 20% to 80% (noncondensing)

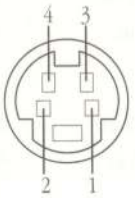
Altitude

- 0 to 3048 m (0 to 10,000 ft.)

Ports and pin assignments

This section lists the pin assignments and functions for all the external connectors.

△ **Important:** The connector type listed for each port indicates the correct plug to use with the port illustrated. △

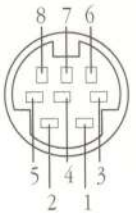


Apple Desktop Bus

Pin	Signal name	Signal description
1	ADB	Data
2	PSW	Reset Key*
3	+5v	+5 volts DC
4	GND	Signal ground

*Reset signal used to generate Reset and Interrupt key combinations

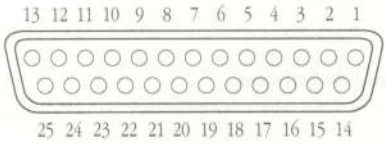
- Connector type: 4-pin minicircular
- Total length of all cables not to exceed 5 m (16 ft.)



Modem and printer ports

Pin	Signal name	Signal description
1	HSKo	Handshake out
2	HSKi	Handshake in/external clock
3	TXD–	Transmit data –
4	GND	Signal ground
5	RXD–	Receive data –
6	TXD+	Transmit data +
7	NC	No connection
8	RXD+	Receive data +

- Connector type: 8-pin minicircular

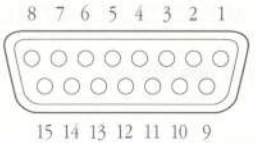


SCSI port

Pin	Signal name	Signal description
1	REQ/	Request
2	MSG/	Message
3	I/O/	Input/Output
4	RST/	SCSI bus reset
5	ACK/	Acknowledge
6	BSY/	Busy
7	GND	Signal ground
8	DB0/	Data bit 0
9	GND	Signal ground
10	DB3/	Data bit 3
11	DB5/	Data bit 5
12	DB6/	Data bit 6
13	DB7/	Data bit 7
14	GND	Signal ground
15	C/D/	Command/Data
16	GND	Signal ground
17	ATN/	Attention
18	GND	Signal ground
19	SEL/	Select
20	DBP/	Data parity
21	DB1/	Data bit 1
22	DB2/	Data bit 2
23	DB4/	Data bit 4
24	GND	Signal ground
25	TPWR	Terminator power

- Connector type: DB-25
- Total length of all cables not to exceed 6 m (20 ft.)

▲ **Warning:** The SCSI port uses the same type of connector as a standard RS-232, DB-25 serial interface, but it is electrically very different. Do not connect any RS-232 device to this connector. Doing so can result in damage to both the device and the Macintosh LC. ▲



Video port

Pin	Signal name	Signal description
1	RED.GND	Red video ground
2	RED.VID	Red video
3	CSYNC/	Composite sync
4	MON.ID1	Monitor ID, bit 1
5	GRN.VID	Green video
6	GRN.GND	Green video ground
7	MON.ID2	Monitor ID, bit 2 (grounded)
8	NC	No connection
9	BLU.VID	Blue video
10	MON.ID3	Monitor ID, bit 3
11	C&VSYNC.GND	Composite and vertical sync ground
12	VSYNC/	Vertical sync
13	BLU.GND	Blue video ground
14	HSYNC.GND	Horizontal sync ground
15	HSYNC/	Horizontal sync
Shell	CHASSIS.GND	Chassis ground

- Connector type: DB-15

Sound output port

Pin	Signal name	Signal description
(Sleeve)	GND	Signal ground
(Middle)	AUDIO	1 volt peak-to-peak audio signal
(Tip)	AUDIO	1 volt peak-to-peak audio signal

- Connector type: Stereo miniature phone plug
- The internal speaker is disabled when this port is in use.

Sound input port

Pin	Signal name	Signal description
(Sleeve)	GND	Signal ground
(Middle)	MicPWR	Microphone power, +8 volts ±5% @ 1 mA
(Tip)	SND.IN	Sound input signal, 1.6K ohm ±10% impedance, 4 mV maximum signal without clipping

The Apple Publishing System

This Apple™ manual was written and edited on a desktop publishing system using Apple Macintosh™ computers and Microsoft Word. Line art was created with Adobe Illustrator 88. Pages were composed in QuarkXPress. Proof pages were created on Apple LaserWriter™ printers. Final pages were output directly to separated film on Linotronic imagesetters.

Display type is Apple's corporate font, a condensed version of Garamond. Text type is Adobe Garamond. Ornaments are ITC Zapf Dingbats®, MerrionSquare, and HyperCharacters.

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